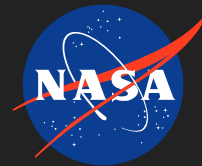


# Cumulative Metamodeling with Uncertainty Estimation: a New Approach to Optimization of Highly Integrated Flight Vehicles, Phase I

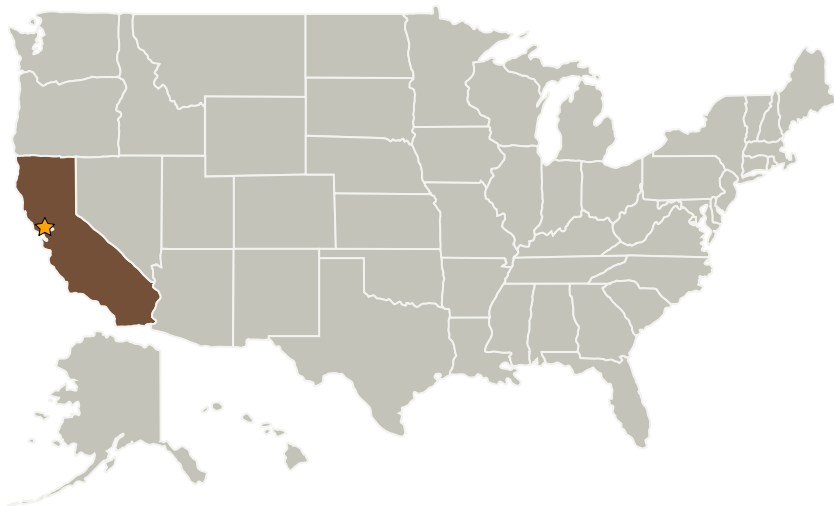
Completed Technology Project (2007 - 2007)



## Project Introduction

Future adaptive, smart air vehicles will continually tune themselves using sophisticated on-board health management and on-the-fly optimization of performance parameters. To support these dynamic, complex/nonlinear, and multidisciplinary optimization tasks requires novel methodologies. These new methodologies must be capable of assimilating data from disparate (heterogeneous) sources in a potentially high-dimensional parameter space, yet provide robust and updatable predictions. Recent progress in cumulative metamodel technology suggests new optimization methodologies capable of combining a priori mathematical models, numerical predictions, and noisy experimental data. The resulting representations can be constructed on-the-fly and are cumulatively enriched as more data become available. Nielsen Engineering & Research (NEAR) proposes to investigate the use of Cumulative Global Metamodels (CGM) in novel optimization techniques for conceptual design of highly integrated flight vehicle and air space concepts. The Phase I will investigate the feasibility of an orders-of-magnitude acceleration in nonlinear multidimensional design by combining existing search techniques with adaptive CGMs. A special emphasis of the work will be to capitalize on NEAR's CGM uncertainty estimation capabilities to monitor the quality of the metamodel and provide confidence estimates which can be used to guide optimization in a rational and systematic way.

## Primary U.S. Work Locations and Key Partners



Cumulative Metamodeling with Uncertainty Estimation: a New Approach to Optimization of Highly Integrated Flight Vehicles, Phase I

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Ames Research Center (ARC)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

# Cumulative Metamodeling with Uncertainty Estimation: a New Approach to Optimization of Highly Integrated Flight Vehicles, Phase I

Completed Technology Project (2007 - 2007)



Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Nielsen Engineering & Research, Inc.	Supporting Organization	Industry	Santa Clara, California

## Primary U.S. Work Locations

California

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX17 Guidance, Navigation, and Control (GN&C)
  - └ TX17.6 Technologies for Aircraft Trajectory Generation, Management, and Optimization for Airspace Operations
    - └ TX17.6.1 Strategic Management of Air Vehicles